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Kansas Department of Health and Environment  
Bureau of Air and Radiation

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**Portable Combustion Gas Analyzer  
Technical Guidance Document - BAR 1998-01**

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### Use of Portable Combustion Gas Analyzers for Periodic Monitoring

A number of manufacturers have made portable combustion gas analyzers available to measure various gas concentrations, which could be applied to stack gases. The Department believes that many of these analyzers could be used to provide data which can be used for making periodic demonstrations of whether a combustion source is operating in compliance with applicable emission limitations. In order for the portable analyzer to give reliable measurements of stack gas concentrations, the instrument must be calibrated and maintained properly, and the stack gas sampling and conditioning system must be operated and designed properly. In addition to concentration measurements which could be provided by the analyzer, most permit conditions and emission limitations require the collection of additional data. In order to better define the conditions and types of facilities where these analyzers could be used, the Department has developed the following guidelines for the use of portable analyzers in compliance demonstrations.

Department approval is required prior to use of a portable analyzer to meet any air quality regulatory requirement. The following requirements cannot be satisfied through the use of portable analyzers:

1. Initial performance tests required by 40 CFR Part 60. The applicable reference method specified in Part 60 must be used to satisfy the initial performance test requirements.
2. Measurements taken to calculate mass emission rates on existing units which will be scheduled to be shut down in order to qualify for emission credits under the Prevention of Significant Deterioration Rule (PSD). In these cases, the applicable AP-42 emission factor or a reference method from Appendix A of 40 CFR Part 60 should be used to quantify stack emission rates.
3. Initial performance tests required to demonstrate conditions with a Best Available Control Technology (BACT) limitation in a PSD permit, unless the PSD permit specifically allows the use of the portable analyzer for the initial compliance demonstration. Usually, the applicable reference method from Appendix A of 40 CFR Part 60 would be required.

## General Requirements for Portable Analyzers

The following requirements are applicable to all portable analyzer systems:

1. Unless otherwise approved by the Department, the tester must prove to the Bureau the combustion analyzer's capability by running calibration gas audit according to the full EPA procedures of 40 CFR Part 60 Appendix F the first time the analyzer is used. Following the audit, a test report must be submitted to the Department.
2. A quality assurance plan must be developed and maintained for the portable analyzer. The plan should include the calibration and maintenance needed to ensure the analyzer is operating and maintained properly. The plan must be available upon request by the Department. The Department may request revisions to the plan when problems with the quality of the data or the performance of the analyzer and associated sampling systems are indicated.
3. Measurements taken to demonstrate compliance with a mass emission rate must include an initial performance test using reference test method(s) from Appendix A of 40 CFR Part 60 in parallel with the portable analyzer.
4. Sample Conditioning
  - A. The following conditions may or may not be necessary depending on the type of portable combustion analyzer to be used. The manufacturer's directions should be followed. The manufacturer's specifications will indicate whether the cells that measure the pollutants are affected by moisture. If no moisture removal methods are required, the manufacturer's data which demonstrates this should be included in the quality assurance plan.
  - B. A portable pump may be needed in the sampling line to pull the sample more quickly. The analyzer sample may be taken before or after the pump. Care should be taken in designing the sample system so that moisture does not condense in the sampling system lines, and the sample is not contaminated with oil or dirt. Care must also be taken not to pull the sample from inside of the combustion analyzer. If the portable pump is too strong it will override the small pump in the analyzer.
  - C. If moisture removal is necessary, the stack gases shall be passed through a moisture removal system which conforms to Method 6C, Section 5.1.5 of 40 CFR Part 60 Appendix A or any system that will remove the water vapor prior to entering the analyzer on a continuous basis without removing a significant amount of the gases to be measured.
5. Analyzer Range/Sensitivity
  - A. The analyzer's range and sensitivity shall conform to Method 6C, sections 2.1 and 2.2.
  - B. The system response time as defined in Method 6C, Section 6.4. 1. The results of the response time test must be included in the test report.



## 6. Analyzer Calibration

- A. For CO and NO<sub>x</sub> measurements, the combustion analyzer must meet the performance requirements of 40 CFR Part 60 Appendix A, Method 6C for CO and NO<sub>x</sub>, modified as follows:
1. Analyzer calibration error: less than  $\pm 4\%$  of the span for the zero, midrange, and high range calibration gases. Use the procedure of Method 6C, Section 6.3.
  2. Sampling system bias: less than  $\pm 10\%$  of the span for the zero, midrange, and high range calibration gases. Use the procedure of Method 6C, Section 6.4.
  3. Zero drift: less than  $\pm 6\%$  of the span over the period of each run. Use the procedure of Method 6C, Section 7.4.
  4. Calibration drift: less than  $\pm 6\%$  of the span over the period of each run. Use the procedure of Method 6C, Section 7.4.
- B. For engines fueled by natural gas the analyzer need not be calibrated for NO<sub>2</sub> provided that in all emissions calculations the tester agrees to use an NO<sub>2</sub> concentration equal to 10% of the measured NO concentration or the measured NO<sub>2</sub> concentration, whichever is greater.
- C. Three calibration gases, as specified in Method 6C, Sections 5.3.1 through 5.3.2, shall be used. Ambient air may be used as the zero gas, provided care is taken to ensure the local ambient air is not influenced by nearby emission sources.
- D. The calibration gases for NO, CO, and O<sub>2</sub> shall be certified to  $\pm 3\%$  accuracy. All calibration gases should be used from their original containers.
- E. If excess combustion air is determined using the oxygen sensor of the combustion analyzer, the analyzer's oxygen sensor must meet the calibration specifications of Condition 5.A.1 through 5.A.4, above.

## 7. Stack Gas Volumetric Flow and Moisture Content

In order to calculate mass emission rates, an estimate or measurement of stack gas flow rate must be made. The following methods can be acceptable for determining stack gas flow rate:

- A. Methods 1-4 of 40 CFR Part 60 Appendix A.
- B. Method 19 of 40 CFR Part 60 Appendix A. Use of this method requires measurement of fuel consumption rate and heating value. If the default F factors are not used, a fuel analysis must be included to support the calculated F factor.
- C. Alternative methods may be acceptable if prior approval is obtained from the Department.

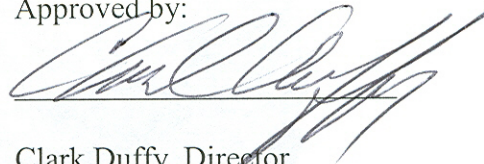
8. Sampling system requirements:

- A. For sampling systems that are not a permanent part of the stack and associated exhaust system, the sample should be drawn from an area in the stack consistent with Methods 1-4, 40 CFR Part 60.
- B. For sampling lines which are to be permanently attached to the stack, the suggestions in 40 CFR Part 60 Appendix B, Performance Specification 2 should be followed regarding sampling point locations.
- C. The sampling lines and associated hardware must be capable of passing a leak check procedure in order to prevent dilution of the sample with ambient air.
- D. A sample flow rate control valve or rotometer shall be used to maintain a constant sampling rate within 10%. The flow rate control valve or rotometer will be used during all measurements, as well as during the calibration.
- E. The test shall consist of a minimum of three runs.

Additional Data Requirements

Additional data may be required regarding source process operation or ambient weather conditions, depending upon the type of emission limitation the analyzer data will be used to calculate. Mass emission rates will require a measure or calculation of stack gas flow rates. Determination of engine horsepower may be needed for expressing emissions as grams per horsepower-hour. 40 CFR Part 60 Subpart GG calculations require combustor inlet pressure, ambient temperature, and ambient humidity. Procedures detailing how the additional data will be acquired must be included in the quality assurance plan, and may need Department approval.

Approved by:



Clark Duffy, Director  
Bureau of Air and Radiation